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Efficacy of Different Educational Methods for a High School Prenatal Substance Use Prevention and Nutrition Program

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A thesis
presented to
the faculty of the Department of Family and Consumer Sciences
East Tennessee State University

In partial fulfillment
of the requirements for the degree
Master of Science in Clinical Nutrition

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by
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May 2004

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Keywords: train the trainer, substance use, pregnancy, nutrition

ABSTRACT

Efficacy of Different Educational Methods for a High School Prenatal Substance Use Prevention and Nutrition Program

by

Kimberly R. Webb

The purpose of this study was to increase knowledge of the effects of prenatal substance use and to introduce the special nutritional needs of pregnancy in two counties in a region with high rates of low birth weight and prenatal substance abuse. A comparison of the efficacy of the educational program being delivered by a registered dietitian or by a group of high school students trained by the dietitian was performed. One hundred six high school students participated in the program and took identical pre- and posttests. The tests were compared to measure knowledge gain and were analyzed by paired t-tests. All respondents demonstrated a statistically significant increase in knowledge. The group receiving instruction from the registered dietitian and the group receiving instruction from the trained high school students demonstrated virtually identical gains in knowledge as measured by the testing instruments.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my committee chair, Beth Lowe, for her role in the completion of this document. The time she spent in its proofreading and constructive criticism is invaluable. I also appreciate her willingness to advise me both in scholastic other matters during the last two years. The way that she cares for and respects her students surpasses the student-teacher and colleague relationships so that we are all friends. Thank you also to my committee members Jamie Kridler and Alison Schaefer for their time and expertise.

Thank you to Kristen Heier who completed a follow-up to my study, but most importantly has been a true friend for the past two years. I have some excellent memories of graduate school thanks to Kristen and the great circle of friends in which she so willingly included me. I wish all the best for her as she begins her married and professional life.

I would also like to thank all of my family for their genuine care and many levels of support. Specifically to my mother, Karen Webb, who is also my best friend. She has always done everything possible to anticipate and meet my many needs, and this has not faltered even today as we spend much less time together than either of us would like. She is my greatest emotional support and serves as an excellent model for grace and perseverance.

Finally, a very special thanks goes to my boyfriend, B.J. Dempsey. I feel especially lucky to have met someone so loving and supportive at a time when that was exactly what I needed. He can make me laugh through the hard times and has been amazingly willing to go out of his way in order for us to spend time together. His generosity, especially with his time, never-ending encouragement, and selfless love, abound.

I appreciate each of you and the important and unique part that you have played in my life. I value your additions to the sum of my person and experiences to this point.

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CHAPTER 1

INTRODUCTION

This study was performed as the first of two companion studies with the purpose of increasing knowledge of the effects of prenatal substance use and introducing the special nutritional needs of pregnancy in two counties in a region with high rates of low birth weight and prenatal substance use. The intervention was performed with both rural and urban populations within the region. The principal investigator, a registered dietitian, trained a group of high school seniors to present the nutrition education program to Wellness classes in their school. Efficacy of the delivery of the educational program by the registered dietitian or by the group of high school students trained by the dietitian was performed by comparison of identical pre- and posttest scores. The second study focused on the students' retention of the information by administration of a retention test as well as the perceptions of the student trainers about their roles in the education program. This information was collected by means of a focus group.

Background

A low birth weight infant is any infant weighing less than 5.5 pounds, or 2500 grams, at birth.[1] Low birth weight infants are at increased risk for serious illnesses such as respiratory disease and even death.[2] Infants born to teen mothers are at increased risk for being low birth weight.[2] Low birth weight may also be the direct result of substance use and abuse during the gestational period and/or a result of inadequate dietary intake.[2] The northeast region of Tennessee currently has a rate of 65.7 low birth weight births per 1,000 population, and 14.5% of all births are to adolescent and teen mothers aged 10-19.[3] From 1999 to 2001, the average percentage of low birth weight births was 9.2% of live births for the state of Tennessee and 7.6% for the United States.[4]

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a national, government-funded need-based supplemental food program for individuals who meet certain income and health guidelines.[5] Participants must be certified for the program based on the established guidelines. WIC certification data for the northeast region of Tennessee for 2001 indicate that 37% of all pregnant women certified for WIC were certified due to substance use including alcohol, tobacco, and illicit drugs, and 73% of all pregnant women certified were certified due to inadequate dietary intake.[3]

Should they become pregnant, the population targeted in this study is at high risk for delivering low birth weight infants due to the combined factors of being in the adolescent age group and living in a region where substance use and inadequate dietary intake in pregnancy are apparently commonplace. At the present time, there is no established program in either the middle schools or high schools in the area to educate this at-risk population on the dangers of prenatal substance use and the importance of proper dietary practices during pregnancy. The "train-the-trainer" teaching method involves an expert teaching a skill to a group that they in turn teach to others. Studies using the train-the-trainer method have proven to be effective in many different settings, including health promotion.[6,7,8] This study targets the high-risk adolescent population to encourage healthy habits in pregnancy with the goal of preventing low birth weight, fetal alcohol syndrome, and fetal alcohol effect, while encouraging adequate nutritional intake and weight gain in pregnancy with special emphasis on folic acid and calcium.

Statement of the Problem

The purpose of this research was to develop an educational program for high school students to increase their knowledge of nutrition and the effects of substance use in pregnancy. The program was implemented by a registered dietitian presenting the lesson or by high school seniors trained by the dietitian to present the lesson.

Significance of the Problem

Despite the prevalence of drug and alcohol use during pregnancy and the low birth weight rate in the Northeast Region of Tennessee, there was no program in either the middle schools or high schools to educate on the effects of these dangerous behaviors. Although this problem is one that has directly affected adolescents, it was difficult in many cases to find schools with principals and teachers willing to allow the single 90-minute lesson on the topic of prenatal substance use prevention and nutrition. While a portion of the material was covered in Wellness and Health classes, the lesson used in the study was more in-depth. One possible reason for the reluctance of school personnel to allow this and other special health programs was because although the health material is required by the Standards for Healthful Living[9] established by the state of Tennessee Department of Education, the students were not directly tested on the material in standardized tests. If teachers and administrators only expose their students to material covered by these tests, the students suffer by not receiving important health information that the State Department of Education feels is essential for every high school student to know.

Hypothesis

There will a significant difference between the knowledge demonstrated by ninth grade students who receive instruction on the topics of prenatal substance use and prenatal nutrition from an expert and those who receive the instruction from a group of expert-trained high school students as indicated by the comparison of pretest and posttest scores.

Null Hypothesis

There will be no significant difference between the knowledge demonstrated by ninth grade students who receive instruction on the topics of prenatal substance use and prenatal nutrition from an expert or from a group of expert-trained high school students as indicated by the comparison of pretest and posttest scores.

Limitations

Limitations of this study include limited access to classes within the schools and the subsequent impossibility of random sampling of schools. Due to the demanding schedule imposed on secondary teachers to meet certain competencies and test their students for those competencies, some teachers and administrators have been reluctant to allow supplementary instruction in the classes. A notable exception is Johnson County High School, where high school seniors in a Health Careers class have used the train-the-trainer method to present the lesson to high school freshmen in Wellness classes. East Tennessee State University (ETSU) has a longstanding relationship with Johnson County through grants funded by the W.K. Kellogg Foundation, which have provided health care and education to this underserved county for the past 12 years. Because of this relationship, the educators in Johnson County recognize ETSU students as a quality resource for their students. They welcome the university students as guest lecturers and are amenable to participation in research studies.

Instituting the program in a second high school demographically similar to Johnson County High School proved to be a great challenge. In schools where the relationship with ETSU was not well established via the Kellogg grants or other programs, administrators were less receptive to opening their schools to university students for health education programs. As a result, this necessitated the second high school receiving the lesson to be a much larger and more affluent high school in Johnson City where the teacher was familiar with the nutrition program at ETSU, rather than in another school in an underserved area.

Definition of Terms

Low birth weight: refers to an infant weighing less than 5.5 pounds, or 2500 grams, at birth.[1]

Fetal alcohol syndrome (FAS): a combination of defects including small head size, heart and central nervous system defects, distinctive facial features, and mental retardation caused by exposure of the fetus to alcohol in pregnancy.[2]

Fetal alcohol effect (FAE): more subtle features of FAS seen in the offspring of women who drink more moderately in pregnancy. [2]

Gestational age: the developmental age of the infant at birth, determined by the length of pregnancy. [1]

Folic acid: a nutrient needed in increased amounts in pregnancy. Folic acid deficiency is related to neural tube disorders. [1]

Neural tube disorders: anomalies such as spina bifida associated with folic acid deficiency. [1]

Premature/pre-term: refers to an infant born prior to 37 weeks gestation.[1]

(Full) term pregnancy: the infant is born in the 37th to 40th week pregnancy. [1]

Train-the-trainer: a teaching method wherein an expert trains a group of individuals to train their peers or another group.

CHAPTER 2
REVIEW OF LITERATURE

Trends and Outcomes in Adolescent Health and Pregnancy

Despite decreases in teen birth rates in recent decades, there are certain characteristics of young women who tend to become pregnant during adolescence. According to a 2003 study by Elfenbein and Felice, similarities exist among many women who become pregnant as adolescents. The authors list poverty, single-parent families (mostly with an absent father), and drug and alcohol abuse among these characteristics. The same study also outlines outcomes of infants born to teen mothers and states that the risk for unfavorable outcomes exists beyond infancy to school age and adolescence. Beyond the increased risk for low birth weight being double that of adult women, children of teen mothers are at considerable risk for cognitive and behavioral problems including developmental delays and school failure.[10] These characteristics of the adolescent mothers and their children explain the proliferation of the cycle of poverty and abuse.

An article by Tenore and Lipsky cited the same and other related social factors as better predictors of undesirable pregnancy and neonatal outcomes than age alone. The authors also list recommendations for preventive health services for adolescents including promotion at the community level. Based on this need, five national organizations (U.S. Department of Health and Human Services, the American Medical Association, the Maternal and Child Health Bureau of the Health Resources and Services Administration, the American Academy of Pediatrics, and the American Academy of Family Physicians) have developed guidelines for adolescent screening and preventative services targeting improved diet, physical activity, and healthy lifestyles, while decreasing sexual behavior, tobacco, alcohol, and drug use.[11] Adolescence is undoubtedly an ideal time to focus on prevention as, stated by Elizabeth Feldman:

> The main sources of disease, death, and disability in this population result from risky behaviors and risky environments. Habits and behavior patterns established during adolescence, such as tobacco use, alcohol use, poor dietary habits, obesity, and physical inactivity, can be the precursors of serious adult health and economic problems. The major causes of death in North America, heart disease, cancer, and stroke can be linked to behaviors developed during adolescence. Other events occurring during adolescence, such as unintended pregnancy and childbearing, also have lifelong implications.[12]

Prevalence of Low Birth Weight in Tennessee

According to information from the March of Dimes, an average of 1531 babies are born in Tennessee each week. Of those, 220 are born to teen mothers, and 141 are born low birth weight. Among the major risk factors for low birth weight, the organization lists multiple birth, pre-term delivery, smoking, and inadequate maternal nutrition. Their data for Tennessee also include percent of low birth weight by county. The average for the United States was 7.6% for 1999 through 2001. The rate for Johnson County (the location of the train-the-trainer presentation) was 10.4%, and the rate for Washington County (the location of the presentation by the registered dietitian) was 7.9%.[4]

Effects of Drug and Alcohol Exposure in Pregnancy

As revealed by findings from the 1999 National Household Survey on Drug Abuse, as many as 17.4 million Americans, including adults, children, and pregnant women have been exposed to illegal drugs.[13]

The Maternal Lifestyle Study was designed to define the effects of drug use in pregnancy without using retrospective and confounded data. The most notable of the findings of this study was that the frequency of detrimental effects of cocaine use was much lower than in previous research. However, approximately 93% of all women who use cocaine in pregnancy also admitted to using other drugs that are known to be detrimental to the fetus, especially tobacco and alcohol.[13]

New research on the brains of fetuses exposed to alcohol has revealed that alcohol may actually be more toxic than any other abused drug. This is because the impact of alcohol on the developing brain and body is more widespread than other drugs. Alcohol affects several neurotransmitters, whereas cocaine is only absorbed by one. Therefore, any cell in the body will absorb alcohol.[14] These data are concomitant to recommendations by the Centers for Disease Control and Prevention which state that there is no safe time in pregnancy for drinking alcohol, nor is there a known safe amount. Drinking in any amount increases the risk for fetal alcohol syndrome which is a set of characteristics marked by irregular facial features, delayed growth, central nervous system problems, and learning disabilities or mental retardation.[15]

The effects of nicotine on infants born to mothers who smoke is also of great concern as smoking rate is approximately 25% of all pregnancies.[16] A 2001 study revealed a dose-dependent relationship between maternal smoking and low birth weight, spontaneous abortion, cognitive delays, and behavior problems.[16]

Training the Trainer

The train-the-trainer method can be employed and applied in a variety of settings including health care if the program follows the steps for developing an effective training program. These steps have been defined as the following: "task analysis, need analysis, and curriculum design."[6] Task analysis describes what the trainers do. Need analysis illustrates the need of the target audience for the training. Curriculum design identifies overall program goals and proposes the format for the course.[6]

The train-the-trainer method has been successful in two very large health promotion campaigns. One was the pilot program for diffusion of an interactive health software program into Alabama middle schools. Facilitators from the school systems were trained to instruct their colleagues and students on its use.[7] Another was a train-the-trainer intervention in which village leaders in Malawi, Africa taught other villagers how to improve their health. This study contributed its success for educating women on the importance of prenatal and postpartum care to the cost-effective nature of the train-

the-trainer model as well as the ease of sustainability. In the Africa program, four years after the first group of trainers was trained, over 20,000 people had been taught by the village trainers. Content for their program included health promotion information in the area of nutrition in addition to the need for preventive medical health care, and especially focused on the topics of childbearing, childbirth, and newborn care.[8]

CHAPTER 3
DESIGN AND METHODOLOGY

Demographics

This study was conducted at two high schools in northeast Tennessee. The school at which trainers from a Health Careers class were used as presenters of the intervention is in a rural southern Appalachian community. The population of the county is approximately 16,600[17] with a primarily Caucasian ethnic background. The extremely mountainous terrain of the area results in the geographic seclusion of many residents. The school in which the registered dietitian presented the lesson is in a much larger, more urban city with well-developed commerce and industry.

The Sample

The sample at the high school using high school senior trainers consisted of 60 students in three ninth grade Wellness classes. The sample where the nutrition expert presented the lesson consisted of 46 students in three Early Childhood Careers classes. Approximately 32.6% of the students were in the tenth grade, 34.9% were in the eleventh grade, and 32.6% were in the twelfth grade.

Testing Tool

The principal investigator developed the testing tool in conjunction with the principal investigator of a study that will follow the research in this study. Graduate faculty in the Department of Family and Consumer Studies reviewed the test. After revisions were made, a panel of judges consisting of second-year graduate students in the Master of Science in Clinical Nutrition program reviewed the test for a second time. After their comments were considered, the test was revised and presented to a group of 10 to 14 year-olds who volunteered to review the test for readability. One of the volunteers reading the test suggested defining a term in the first test question in parenthesis for clarification. Other than this change, all of the adolescents understood the language used on the testing tool and the questions that were being asked. Based

on the comments of the adolescent panel, the test was changed accordingly and was determined by the principal investigator to have good validity. The test was administered on two occasions: once by the principal investigator one week prior to the intervention and once immediately following the intervention. The posttest was administered, collected, and submitted to the principal investigator by the group of trainers in the classes where they presented the intervention. The principal investigator administered and collected the posttest in the classes where she presented the intervention. A copy of each tool is included in Appendix A.

Data Collection Procedure

Permission to conduct this study was granted by the East Tennessee State University Institutional Review Board. The principal investigator met with the teacher and students from the Health Careers class at Johnson County High School to determine their interest in and availability for participating in the study as student trainers. This class was chosen in part because of their experience with presenting health information in the Tar Wars smoking prevention program. Teaching the Tar Wars lessons to fifth grade classes has been part of the curriculum of the Health Careers class for several years. The principal investigator presented the lesson to the Health Careers class for demonstration purposes and to allow the class to ask any questions that they had about the lesson, its presentation, or any other aspect of the study. The students who chose to participate as trainers practiced the lesson in class for several weeks and the principal investigator made two more visits to the class to offer suggestions and answer any more questions that had arisen.

All subjects were given a pretest by the principal investigator prior to the intervention. The educational program was presented to each class either by the principal investigator or by the group of presenters from the Health Careers class at the high school. Material covered in the lessons included background information on low birth weight, normal gestational period, fetal alcohol syndrome and fetal alcohol effect, risks associated with cigarette smoking and drug use in pregnancy, increased nutritional needs and normal weight gain in pregnancy, folic acid, and calcium. The

lesson plan used for the presentations can be found in Appendix B. Students completed an identical posttest at the end of the program. They also completed a retention test a week after the intervention as part of the follow-up study. All subjects were provided a supplemental handout entitled “The Facts about Drugs and Pregnancy” to iterate the information covered on these topics during the lesson and to give more information on street drugs and over-the-counter drugs that were not able to be covered in depth during the education program. The information on the handout was adapted from a March of Dimes pamphlet with the same title and can be found in Appendix C. The lesson plan, testing tools, and handout were developed to meet the goals and objectives listed in Table 1.

Data Analysis

Each question on the testing tool was analyzed by percentage of correct responses. Data for the two groups being studied were collected and organized for entry into an SPSS data file. Means were calculated for each group. Data were analyzed using a paired t-test with an alpha level of .05. The statistical results were used to decide whether the null hypothesis should be rejected or failed to be rejected.

Table 1. Goals and Objectives Used in Lesson Plan and Testing Tool Development.

Goal	Objectives
• Increase knowledge of the harmful effects of drug and alcohol use in pregnancy.	• Identify the causes and symptoms associated with fetal alcohol syndrome (FAS) and fetal alcohol effect (FAE). • State that all cases of FAS and FAE are preventable by avoidance of alcohol during pregnancy. • Define terms related to pregnancy outcome such as low birth weight and gestational age. • Recognize the importance of avoidance of chemical substances at all stages of pregnancy for optimal fetal development.
• Introduction to the special nutritional needs of pregnancy.	• Associate folic acid with prevention of neural tube defects. • Identify foods high in folic acid. • Discuss appropriate weight gain and food choices during pregnancy. • Recognize the special nutritional needs for pregnant adolescents.

CHAPTER 4
RESULTS

The Sample

Participants in the education program at Johnson County High School where students from the Health Careers class presented the lesson were in the ninth grade and enrolled in wellness classes. Participants at Science Hill High School in Washington County where a registered dietitian presented the same lesson ranged in grade level from tenth through twelfth and were enrolled in an Early Childhood Careers class. No data were collected on sex, age, ethnicity, or socioeconomic status. A combined total of 119 students at both locations completed the pretest, and 106 students completed the posttest. Any students who were not present for the pretest were asked not to take the posttest. All students who received the education were willing to complete the posttest and were allowed adequate time to do so.

Data Analysis

The testing tool included 10 objective questions (Appendix A). All of the questions had answers limited to correct or incorrect. The subjects were instructed either to guess or leave the question blank if they did not know the answer. Therefore, non-response was considered as incorrect. The results of the mean scores of the pre- and posttests are listed in Table 2 with responding results of the paired t-tests. The results of each question are listed in Tables 3 and 4, with the number of respondents and the percentage of correct responses for each answer per test administration listed. Paired t-test analysis was used to determine statistical significance for total scores on the pre- and posttests. All tests were performed at the α 0.05 level of significance. The statistical analysis for these items is included in Appendix D.

Table 2. Overall Means for Test Scores				
Group:	**Pretest**	**Posttest**	**p-value for paired t-test**	**Statistical Significance**
All Subjects JCHS	1.6333	7.8333	<.05	Yes
All Subjects SHHS	2.6444	8.9333	<.05	Yes
1st Period JCHS	1.61	7.78	<.05	Yes
2nd Period JCHS	2.11	7.84	<.05	Yes
3rd Period JCHS	1.17	7.89	<.05	Yes
1st Period SHHS	2.63	9.38	<.05	Yes
2nd Period SHHS	2.24	8.53	<.05	Yes
3rd Period SHHS	3.25	8.92	<.05	Yes

Table 3. JCHS Responses to Test Questions (Expert Trained Student Presenters)				
	Pretest n=74 No., (%)		**Posttest n=60 No., (%)**	
Question:	Correct	Incorrect	Correct	Incorrect
1) Folic Acid	1 1.35%	73 98.65%	38 63.33%	22 36.67%
2) Food Sources of Folic Acid	25 33.78%	49 66.22%	49 81.67%	11 18.33%
3) Weight Gain in Pregnancy	24 32.43%	50 67.57%	52 86.67%	8 13.33%
4) Low birth weight	0 0%	74 100%	51 85%	9 15%
5) Weeks gestation	7 9.46%	67 90.54%	51 85%	9 15%
6) Bone mass	3 4.05%	71 95.95%	53 88.33%	7 11.67%
7) FAS	16 21.62%	58 78.38%	55 91.67%	5 8.33%
8) Empty calories	0 0%	74 100%	40 66.67%	20 33.33%
9) Tobacco	37 50%	37 50%	39 65%	21 35%
10) Marijuana	14 18.92%	60 81.08%	42 70%	18 30%

Table 4. SHHS Responses to Test Questions (Expert Presenter)				
	Pretest n=45 No., (%)		**Posttest n=46 No., (%)**	
Question:	**Correct**	**Incorrect**	**Correct**	**Incorrect**
1) Folic Acid	6 13.33%	39 86.67%	41 89.13%	5 10.87%
2) Food Sources of Folic Acid	19 42.22%	26 57.78%	35 76.09%	11 23.91%
3) Weight Gain in Pregnancy	15 33.33%	30 66.67%	41 89.13%	5 10.87%
4) Low birth weight	0 0%	45 100%	42 91.30%	4 8.70%
5) Weeks gestation	12 26.67%	33 73.33%	45 97.83%	1 2.17%
6) Bone mass	8 17.78%	37 82.22%	46 100%	0 0%
7) FAS	3 6.67%	42 93.33%	45 97.83%	1 2.17%
8) Empty calories	7 15.56%	38 84.44%	45 97.83%	1 2.17%
9) Tobacco	27 60%	18 40%	41 89.13%	5 10.87%
10) Marijuana	22 48.89%	23 51.11%	31 67.39%	15 32.61%

Folic Acid

The first two questions addressed folic acid. In the first question, students were asked to name the nutrient. This question indicated one of the most increased areas of knowledge gain from the pretest to the posttest. The second question asked students to choose the food highest in this nutrient from a list of four possible choices. Due to the nature of the multiple-choice format for this question, the number of correct responses on the pretest was relatively high in comparison with the other questions (approximately 34% and 42% at the two schools).

Weight Gain During Pregnancy

The third question was a fill-in-the-blank question that addressed the appropriate amount of weight gain for a normal-weight woman during pregnancy. Because the correct answer to the question reflects a 10-pound range (25-35pounds), all responses that fell within that range were considered correct. There was a significant difference in the number of respondents answering correctly when the pretest was compared to the posttest (greater than 50% improvement at both locations).

Low Birth Weight

The fourth question asked the size of a low birth weight baby. The correct answer to this question is very specific (5.5 pounds). Although several respondents answered with a response that was close to this amount, there were no correct responses on the pretest. The posttest showed 87.7% of correct responses overall.

Weeks Gestation

The fifth question addressed length of gestation. Students were taught in the lesson that any infant born prior to 37 weeks gestation is considered preterm and that 40 weeks is a full term pregnancy. Therefore any answer ranging from 37 to 40 was considered correct on both the testing instruments. Thirty-six was the most common answer on the pretests as many students think of a full term pregnancy in terms of “nine months,” multiplying nine months by four weeks in a month to arrive at 36 weeks. Overall percentage of correct answers increased from 16% on the pretest to 91% on the posttest.

Bone Mass

The discussion of bone mass was included in the lesson to emphasize the importance of adequate calcium intake during adolescence and the increased need for dietary calcium in case of a pregnancy occurring during adolescence. The question on

the testing instrument asked students to identify the amount of bone mass built in the teenage years. Nine percent of all students answered correctly on the pretest, while 93% answered correctly on the posttest.

Fetal Alcohol Syndrome

The seventh test question asked students to name the syndrome characterized by defects of the eyes, nose, heart, and brain that were caused by maternal alcohol consumption. Information on fetal alcohol syndrome (FAS) was an integral part of the lesson with presenters discussing the syndrome, showing pictures of a person with FAS both at six months and twenty years of age, and showing a video on the topic. These strategies were successful in exposing the subjects to the risks of FAS and fetal alcohol effect as indicated by correct responses increasing from 16% on the pretest to 94% on the posttest.

Empty Calories

The eighth item on the testing instrument was one that addressed nutritional habits. Part of the discussion of the nutritional needs of pregnancy included increased calorie needs. Presenters emphasized that these calories should come from foods high in nutritional value, and not empty calories. This information was valuable to all subjects as they were asked to name some foods that they would not consider to be nutritious, or to be a source of empty calories. Correct responses to question number eight increased by a 67% at the school with the student presenters and 82% at the school with the nutrition expert.

Tobacco and Marijuana

The final two questions were concerned with substance abuse, the ninth about tobacco and the tenth marijuana. The ninth question linked the increased risk of low birth weight to smoking. The tenth question addressed below average intelligence in children whose mothers smoked marijuana during pregnancy. Overall, there was a smaller increase in knowledge gain indicated on these two questions. The subjects

appear to have been somewhat confused by which substance contributes to low birth weight and which to reduced intelligence.

CHAPTER 5
DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

Overall, the data collected and analyzed indicate a significant increase in knowledge in high school students participating in educational programs focused on substance use prevention and nutrition in pregnancy. A comparison of the data from the two schools indicate that students in the rural school had a mean score on their pretests that was approximately one point or 10% lower than those in the more urban school. It is impossible to speculate whether this is due to the nature of the student body at the urban school possibly having more access to health information or because they were all one to three years older than the students who participated in the program at the rural school. However, subjects at both of the schools increased their scores by over 60% from the pretest to the posttest. Increase in mean number of testing instrument questions answered correctly was 6.2 more correct responses at the rural school and 6.3 more correct responses at the urban school. The increased level of knowledge is statistically significant when analyzed by a paired t-test with an α level of 0.05. The high level of knowledge gained verifies that the testing tool was appropriate for the population as indicated by the readability test.

Unfortunately, the scope of this research study and the time allowed for its completion did not permit follow-up. A true indicator of the success of this program would be if after years of permanent implementation in one county in northeast Tennessee, the rate of low birth weight and substance use in pregnancy rates in that county subsequent declined.

From observations made of the subjects during the presentation, the ninth graders who participated appeared to be more interested in the subject at the time of the program than the upper-class students. It is impossible to determine whether this difference exists because of the difference in the presenters and presentation styles or because of the difference in age. While most subjects did seem interested at the time

of the presentation, it is unlikely that the information was significantly internalized for future recall during pregnancy after only one session of passive learning.

Limitations experienced in this study would be difficult to avoid in future programs of a similar nature. There will always be a limited amount of time available for supplemental health instruction. Additionally, it proved to be much less complicated to have access to the students in locations where community partnerships between the faculty and students from the university and school system administration and teachers are well-established.

Conclusions

The students participating in the prenatal substance use prevention and nutrition programs in this study were successful in demonstrating an increase in knowledge of the subject matter. The subjects were equally successful in this gain whether the instruction came from other high school students trained to deliver this message by a registered dietitian or if it was delivered by the dietitian. Therefore, the hypothesis was rejected, and the null hypothesis failed to be rejected. Integrating the program within the curriculum of a Wellness class provided an effective way to reach a large number of students at an appropriate age in the geographical area where a need exists.

Recommendations

Reinforcement of the information presented during this study is imperative to advancing the knowledge of the community so they can make informed decisions regarding their health and that of their future children. Providing the information to adolescents and young adults who have more of the risk factors for the health concerns of focus in this study may be beneficial to reducing their prevalence in the region. Integration of these programs into health and/or science curriculums would impact a large number of those people. Programs of a similar nature carried out in the future would benefit from a component of action-based learning incorporated into the lesson design. An activity such as a small group discussion would likely improve retained knowledge. It would be beneficial for a professional to train a group of high school

juniors rather than seniors to present the information so that sustaining the program would be less problematic. The initial group of juniors could present the program for two years. When they became seniors, they could train another group of juniors to present the program, and it could be carried on in that manner indefinitely. Sustainability of such important programs contributes to long-term improved health for communities and promotes independence in decision making both by the trainers who have internalized the information for teaching and by the students who receive the instruction.

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APPENDIX A

TESTING TOOLS

Substance Use in Pregnancy Prevention and Nutrition Pretest

1. There is a nutrient (something that nourishes the body) found in food that is necessary for normal brain and spinal cord development in an unborn baby. Name this nutrient.

   _____

2. Which of the following foods is highest in this nutrient that is necessary for normal brain and spinal cord development?

   a. carrots
   b. orange juice
   b. hamburger
   c. yogurt

3. Approximately how many pounds should a normal-weight woman gain during

   pregnancy? _____

4. How small does a baby have to be at birth to be considered low birth weight?

   _____

5. How many weeks long is a full term pregnancy? _____

6. What percentage of adult bone mass is built in teenage years? _____

7. If a baby has certain defects of the eyes, nose, heart, and brain that were caused by the mother drinking alcohol while she was pregnant, what syndrome does the baby have?

   _____

8. If a food or drink is high in calories with little nutritional value, it is said to have _____ calories.

9. What common habit, if done during pregnancy, doubles the chance of having a low birth weight baby? _____

10. Pregnant women's smoking of _____ has been shown to result in below average intelligence in children.

Substance Use in Pregnancy Prevention and Nutrition Post-test

1. There is a nutrient (something that nourishes the body) found in food that is necessary for normal brain and spinal cord development in an unborn baby. Name this nutrient.

   _____

2. Which of the following foods is highest in this nutrient that is necessary for normal brain and spinal cord development?

   a. carrots
   b. orange juice
   b. hamburger
   c. yogurt

3. Approximately how many pounds should a normal-weight woman gain during

   pregnancy? _____

4. How small does a baby have to be at birth to be considered low birth weight?

   _____

5. How many weeks long is a full term pregnancy? _____

6. What percentage of adult bone mass is built in teenage years? _____

7. If a baby has certain defects of the eyes, nose, heart, and brain that were caused by the mother drinking alcohol while she was pregnant, what syndrome does the baby have?

   _____

8. If a food or drink is high in calories with little nutritional value, it is said to have

   _____ calories.

9. What common habit, if done during pregnancy, doubles the chance of having a low birth weight baby? _____

10. Pregnant women's smoking of _____ has been shown to result in below average intelligence in children.

APPENDIX B

Lesson Plan

Substance Use Prevention and Nutrition in Pregnancy
Lesson Plan
9th Grade Wellness

Goals:

- Students will increase knowledge of the side effects of drug and alcohol use in pregnancy.
- Students will be introduced to the special nutritional needs of pregnancy.

Objectives:

- Students will identify the causes and symptoms associated with fetal alcohol syndrome (FAS) and fetal alcohol effect and be able to state that all cases of FAS are preventable by avoidance of alcohol during pregnancy.
- Students will be able to define terms related to pregnancy outcome such as low birth weight and gestational age.
- Students will realize the importance of avoidance of chemical substances at all stages of pregnancy for optimal fetal development.
- Students will understand the role of folic acid in preventing neural tube defects and will correctly identify foods high in folic acid.
- Students will discuss appropriate weight gain and food choices during pregnancy and will realize that there are special nutritional needs for pregnant adolescents.

Materials:

- Fabulous FAS Quiz Show Video – A Fetal Alcohol Syndrome Prevention Video for Grades 6-9. Produced by the March of Dimes.
- The Facts About Drugs and Pregnancy handout
- Fetus Models (property of Sullivan County Health Department)
- Baby bottle with cigarette butts and beer bottle caps (property of Johnson County High School Health Sciences Class)
- Lesson Posttest

Instructional Techniques:

Introduction:

- Gather necessary materials.
- Introduce presenters and topic.

- Explain that Northeast Tennessee is an area that has more low birth weight (LBW) births than average for the U.S. and that substance abuse and inadequate nutrition in pregnancy are associated with LBW and other poor outcomes of pregnancy.

Background Information:

- Ask students, "How small is a baby that we say is low birth weight?" Let students share ideas. Explain that a low birth weight baby is any infant weighing less than 5.5 pounds at birth.
- Assure students that not all infants born weighing less than 5.5 pounds are small because of maternal substance abuse or malnutrition, but both of these conditions increase the likelihood of having a baby that is born too small or too early.
- Ask, "Why is it important that babies be a good size, larger than 5.5 pounds?" Explain that LBW infants have a high chance of illness and even death.
- Ask students, "How many weeks should a pregnant woman carry the unborn baby?" After students share their ideas, explain that a pregnancy should be 40 weeks in duration.
- The period of pregnancy is also known as *gestation*. A baby born before 37 weeks is called *pre-term,* and the number of weeks into the pregnancy that a baby is born is called its *gestational age*. For example, a baby born 5 weeks prematurely would be *pre-term* and have a *gestational age* of 35 weeks.
- Provide additional information to link concepts that some LBW babies are so small because they were born too early, and others are small because although they had a full 37-40 weeks development, they just failed to grow as much as they should have. This can happen for many different reasons, but one reason could be that the mother used drugs or alcohol.

Alcohol and Drugs

Fetal Alcohol Syndrome (FAS) and Fetal Alcohol Effect (FAE):

- Using alcohol during pregnancy can cause a unique set of characteristics in the infant. Babies born to alcoholic mothers who used alcohol during pregnancy are shown to have defects of the eyes, nose, heart, and brain. These are accompanied by impaired growth, a small head, and mental retardation. This condition is called fetal alcohol syndrome.
- Infants born with FAS are usually irritable and hyperactive. Ask for ideas why the infant may have these behaviors. Explain that the baby is born addicted to alcohol and these are symptoms of withdrawal.
- Many infants with FAS have poor rates of weight gain even with good nutrition. As they get older, they often still grow slower than other children and have problems learning.

- Research during the last twenty years has shown that even more moderate drinking in pregnancy results in some of the more subtle features of FAS. This is called fetal alcohol effect (FAE). For example, the child may not have the noticeable facial features of FAS but may have the more hidden effects such as learning disabilities or heart problems.
- Tell students, "Now we are going to watch a video on FAS and FAE that explains more about those conditions and how they can be prevented. "
- After the video ask, "From the video, how can FAS and FAE be prevented? Is it possible then that there could never be another case of FAS?"
- Reiterate that the only cause of FAS is drinking during pregnancy, so if women would refrain from drinking during this time, all cases of FAS could be prevented.

Tobacco:

- Perhaps a more common habit that some women continue during pregnancy is smoking. The most important risk related to smoking in pregnancy is the increased risk of having a low birth weight baby. In fact, babies born to smokers are at **double** the risk of LBW as babies born to non-smokers.
- Tobacco use also increases the risk of sudden infant death syndrome, asthma, and other respiratory problems.

Marijuana:

- Illegal drugs also seriously affect development. Studies of the effects of prenatal marijuana exposure on brain and intellectual development have shown significant sleep disturbances for the first several years of life. Long term studies have shown that children born to women who smoked marijuana during pregnancy consistently score lower on intelligence and memory tests than other children.

Cocaine, Heroin, Crystal Meth, etc.

- Children born to mothers addicted to cocaine, heroin, or any other street drug suffer the same developmental problems as those who used marijuana, in addition to several other severe effects. These infants are born with severe addiction, are very low birth weight, have severe learning disabilities or may be mentally retarded, and often have defects of one or more organ system (i.e., heart, kidneys).

Alcohol and Drugs Summary:

- Show baby bottle filled with cigarette butts and beer bottle caps. State that every decision that a pregnant woman makes about what she puts into her body affects the baby in some way. State that "No one here would give this bottle to a baby or want it to have any of the side effects that we've talked about today from these drugs that this bottle represents. By drinking alcohol,

smoking, or using drugs in pregnancy, that is essentially what is happening. The baby suffers the effects of the drugs used by the mother."

Nutrition

General

- We know that an infant is affected by any harmful substance that a mother puts into her body like drugs and alcohol. It is also affected by the beneficial things like the nutrients from food. So, every decision that a woman makes during pregnancy really does affect the unborn child.
- It is very important to have the best possible nutrition during all stages of pregnancy because different organs are developing throughout gestation. It is essential to get adequate nutrition if you are sexually active because some very important stages of development including development of the brain and spinal cord begin even before many women know that they are pregnant.
- Pass the fetus models around the room for all students to see. Remind students that the models should not be taken out of the plastic bags. Point out that at the different stages of development, you can see the eyes, ears, etc. begin to develop. If a pregnant woman is not adequately nourished at the time that the development of a certain organ or body part is developing, it may not develop properly. Note that the changes in the first few models indicate development while the later models mainly show growth.

Folic Acid:

- Restate that the brain and spinal cord are already starting to develop before many women are aware that they have become pregnant. The brain and spinal cord are called the *neural tube*.
- Folic acid is a B vitamin that helps prevent neural tube defects, including a defect where part of the spinal cord is not entirely enclosed by the spine, called spina bifida.
- Neural tube defects can be prevented by all women of childbearing age taking a multivitamin that contains 400 micrograms of folic acid every day. This is especially important for anyone who is sexually active.
- A woman who is trying to become pregnant or who has become pregnant should eat a diet including foods high in folic acid and folate, the natural form of folic acid that is found in foods. Good sources of folic acid and folate are fortified cereals, enriched bread products, leafy green vegetables, oranges and orange juice and peanuts. Pregnant women need more folic acid. Most prenatal vitamins meet this need.

Calcium:

- If a young woman does become pregnant during adolescence, her intake of calcium is especially important. **Half**, or **fifty percent**, of adult bone mass is built during the teenage years. This is especially important because the baby needs calcium for its developing skeleton as well.

- If a pregnant woman is not getting enough calcium from her diet to meet the baby's needs, the body will start to leech deposited calcium from the mother's calcium stores which are the bones and teeth.
- If a teenage mother is not consuming enough calcium-rich foods to meet her needs for bone building and the baby's needs for development, the body provides the calcium to the baby first. This leaves the mother at high risk for brittle bone diseases such as osteoporosis later in life.
- Ask students "What are good dietary sources of calcium?" Remember that these sources are dairy products such as milk, yogurt, and cheese.

Increased Nutritional Needs and Weight Gain:

- With the increased nutritional demand placed on the body by pregnancy it is important to eat a balanced diet that will provide enough calories to support the growth of the baby and the continued health of the mother. This is especially important in pregnant teenagers whose bodies are still growing themselves at the same time that their babies are developing.
- To meet her increased nutritional needs, a pregnant woman should consume about 500 calories per day above her pre-pregnancy needs. Ask students for examples of what foods might provide 500 calories. A good example would be a peanut butter sandwich and a glass of milk. This snack incorporates foods from three food groups on the Food Guide Pyramid (bread, meat and nuts, and dairy).
- Stress that the diet of a pregnant woman should consist of a variety nutritious foods. Pregnancy should not be a time to indulge in too many foods that are high in calories but have few vitamins and minerals. These foods with many calories but little nutritional value are said to have *empty calories*. Ask students to name some foods or drinks with *empty calories*. Candy, pastries, potato chips, and sweetened drinks like soda are common examples of foods with empty calories.
- One simple measure that the pregnant woman remains in good health and that the baby is growing normally is weight gain. Weight gain is healthy during pregnancy
- Ask students, "Do you know how much weight a woman should gain when she's pregnant?" If she was normal weight-for-height before pregnancy, she should gain **between 25 and 35 pounds**. If she was underweight, she should gain more, and if was overweight prior to pregnancy, she could safely gain less, but the doctor will be able to tell the woman what amount of weight gain is right for her.
- A pregnant woman should never try to lose weight. Most women experience a 12 to 14 pound weight loss within a week after delivering their babies, and the rest of the weight should be lost within a year with healthy eating and usual activity. Weight loss occurs more quickly if the mother is breastfeeding.

Nutrition Summary:

- We have learned today that one of the most important times for nutrition in the life of a woman is during pregnancy. This is especially true if the pregnancy occurs during adolescence, or the teenage years, when the mother's body is still growing and developing. Folic acid or folate is a nutrient found in food that is important for the development of the brain and spinal cord of babies born to women of any age. This nutrient can be found in orange juice, enriched breads and cereals, and green leafy vegetables. It is especially important for teenage mothers to also incorporate plenty of calcium-rich foods into their diets, because they are developing half of their bone mass during adolescence. Like all of us, a pregnant woman should try to eat a variety of nutritious foods and avoid empty calories. All normal weight women should gain 25 to 35 pound during pregnancy.

Ask if there are questions.

Announce and distribute posttest.

APPENDIX C

Supplemental Handout

The Facts about Drugs and Pregnancy

Drugs and alcohol aren't good for anyone, but they're even worse for an unborn baby.

THE FACTS ABOUT ALCOHOL

- If a pregnant woman drinks any kind of alcoholic beverage – like beer, wine, wine coolers, liquor, or mixed drinks – it reaches the baby.
- Drinking in pregnancy could cause a baby to be born with fetal alcohol syndrome (FAS).
- Babies with FAS generally have small heads, are mentally retarded or have learning disabilities, and often have heart defects and other physical problems.
- Even small amounts of alcohol can increase the risk of birth defects, so the safest choice is not to drink alcohol at all during pregnancy.

THE FACTS ABOUT TOBACCO

- Smoking hurts mother and baby. Smoking during pregnancy increases the chances of:
    - Low birth weight
    - Miscarriage or stillbirth
    - Learning and behavior problems
    - Sudden Infant Death Syndrome
    - Asthma or other respiratory problems.

THE FACTS ABOUT DRUGS

- A woman who uses cocaine or crack during pregnancy may have a baby who has a stroke before it's born.
- The baby may be low birth weight and unable to breathe on its own.
- A pregnant woman who uses heroin will have a baby born addicted and go through withdrawal soon after birth.
- The use of any street drugs at all will result in a baby that is born with health problems.

Always consult with a health care provider before taking any prescription or over-the-counter medication in pregnancy.

APPENDIX D

Statistical Analysis

t-test overall results for Schools A and B

Paired Samples

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	School A	1.633	60	1.3272	.1713
	School A	7.833	60	1.9148	.2472
Pair 2	School B	2.644	45	1.5689	.2338
	School B	8.933	45	1.3382	.1994

Paired Samples

		N	Correlation	Sig.
Pair 1	School A Pretests & School A	60	.729	.000
Pair 2	School B Pretests & School B	45	.692	.000

School A = Johnson County High School, expert-trained student presenters
School B = Science Hill High School, expert presenter

t-test for School A, Period 1
Pretest and Posttest Scores

Paired Samples

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	School A 1st Pretest	1.61	23	1.725	.360
	School A 1st Posttest	7.78	23	2.173	.453

Paired Samples

		N	Correlation	Sig.
Pair 1	School A 1st Pretest Scores & School A 1st Posttest	23	.776	.000

t-test for School A, Period 2
Pretest and Posttest Scores

Paired Samples

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	School A Period Pretest	2.11	19	1.100	.252
	School A Period Posttest	7.84	19	2.007	.461

Paired Samples

		N	Correlation	Sig.
Pair 1	School A Period 2 Scores & School A 2 Posttest	19	.737	.000

t-test for School A, Period 3
Pretest and Posttest Scores

Paired Samples

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	School A 3rd Pretest	1.17	18	.707	.167
	School A 3rd Posttest	7.89	18	1.530	.361

Paired Samples

		N	Correlation	Sig.
Pair 1	School A 3rd Pretest Scores & School A 3rd Posttest	18	.888	.000

t-test for School B, Period 1
Pretest and Posttest Scores

Paired Samples

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	School B 1st Pretest	2.63	16	1.628	.407
	School B 1st Posttest	9.38	16	.500	.125

Paired Samples

		N	Correlation	Sig.
Pair 1	School B 1st Pretest Scores & School B 1st Posttest	16	.840	.000

t-test for School B, Period 2
Pretest and Posttest Scores

Paired Samples

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	School B 2nd Pretest	2.24	17	1.200	.291
	School B 2nd Posttest	8.53	17	1.875	.455

Paired Samples

		N	Correlation	Sig.
Pair 1	School B 2nd Pretest Scores & School B 2nd Posttest	17	.858	.000

t-test for School A, Period 3
Pretest and Posttest Scores

Paired Samples

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	School A 3rd Pretest	1.17	18	.707	.167
	School A 3rd Posttest	7.89	18	1.530	.361

Paired Samples

		N	Correlation	Sig.
Pair 1	School A 3rd Pretest Scores & School A 3rd Posttest	18	.888	.000

VITA

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